IV.B. – Assessing Low-Probability, High-Impact Events

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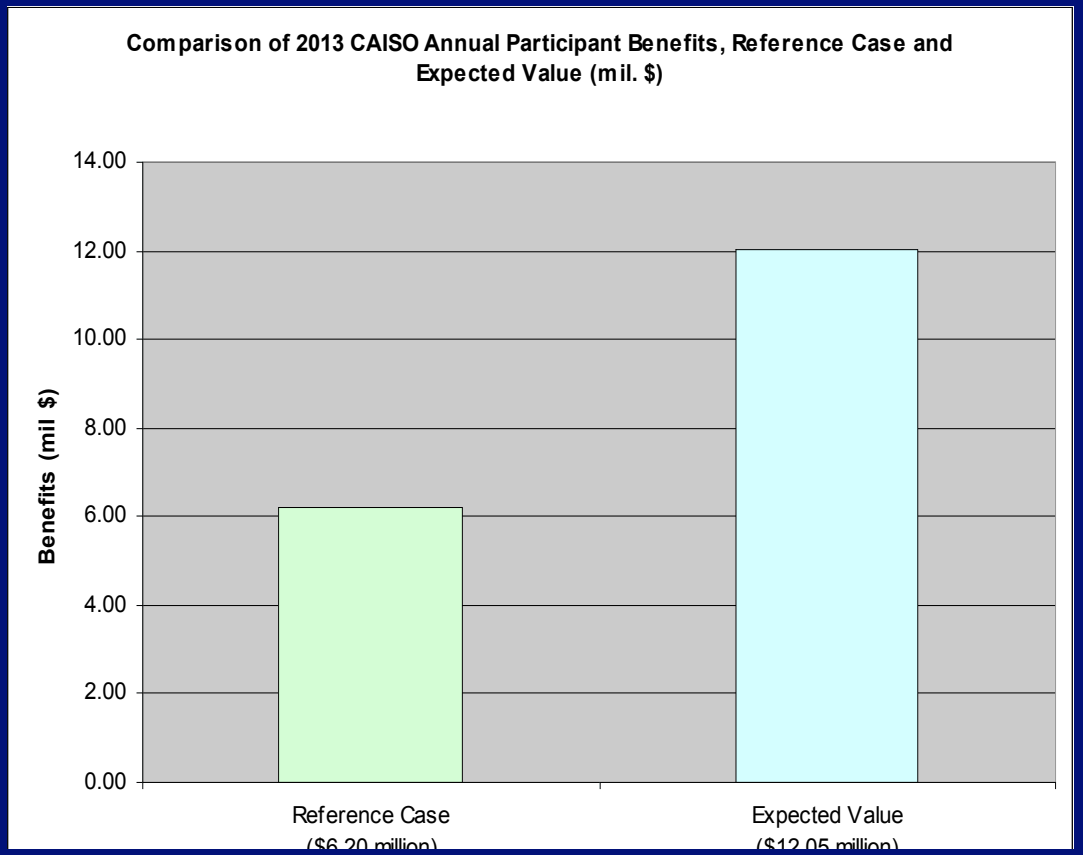
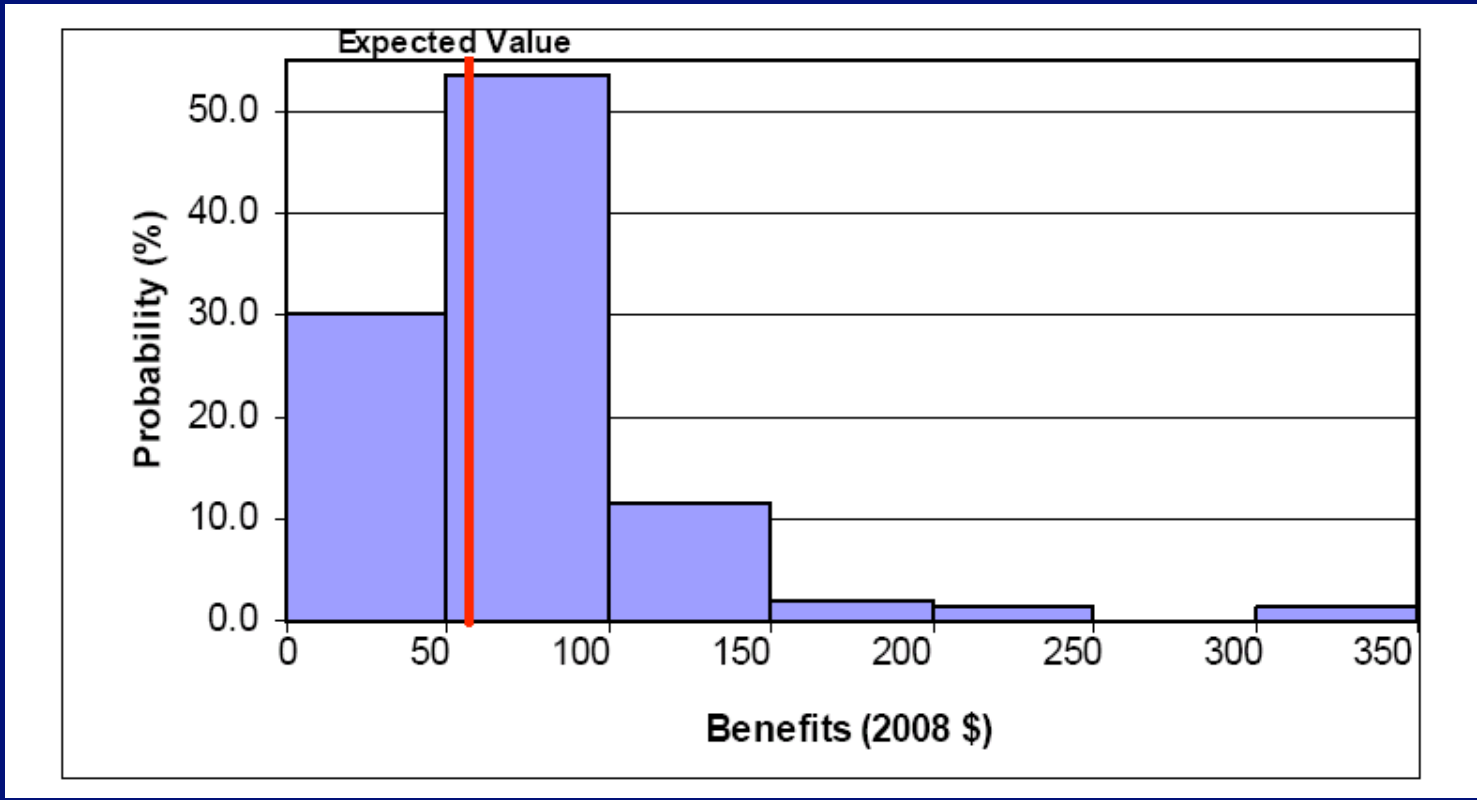
Purpose of Presentation

- Purpose of sensitivity cases
  - Expected Value
  - Distribution of Benefits
- Recent CAISO case study
  - Palo Verde-Devers (PVD2)
- Proposed general methodology

Purpose of Sensitivity Cases – Expected Value



Purpose of Sensitivity Cases – Distribution of Benefits



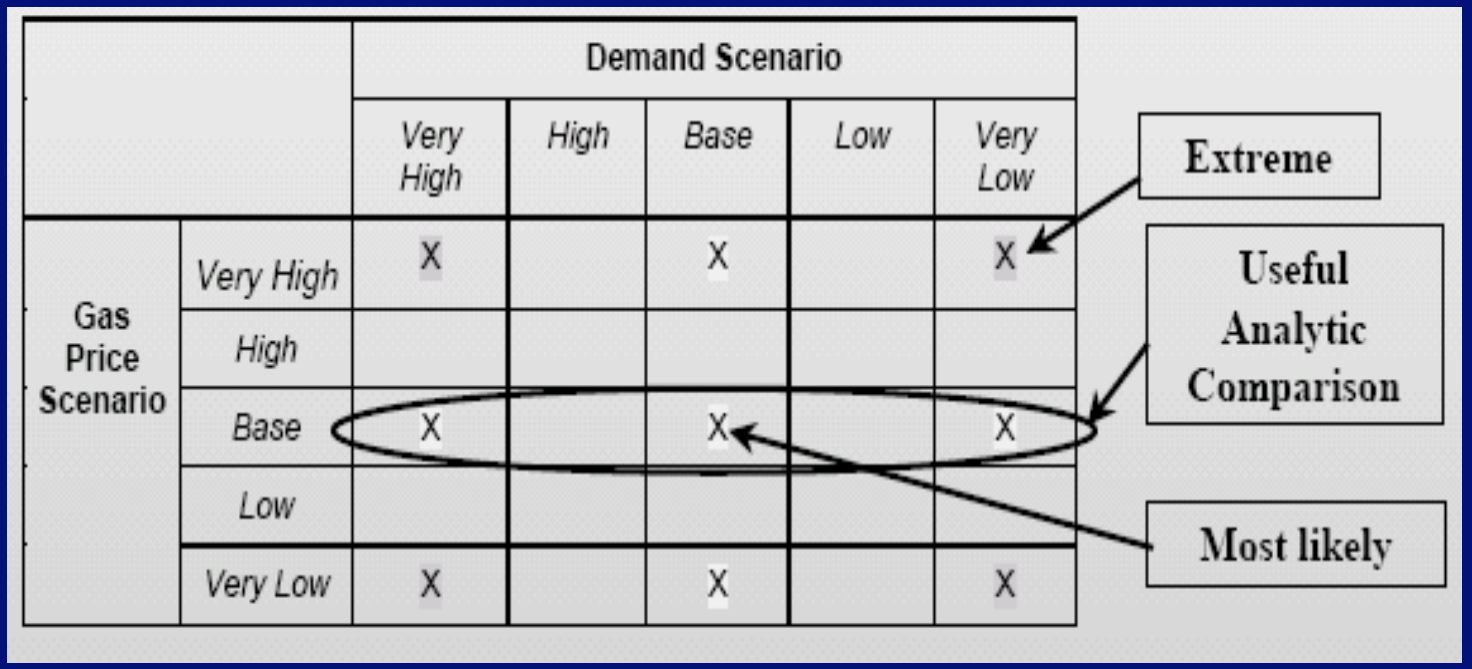
PVD2 Sensitivity Case Selection

- Determined uncertain variables
  - Significant impact on results
  - Highly uncertain
  - Quantifiable probability distribution
- Selected most important sensitivity cases
- Assigned probabilities to sensitivity cases

PVD2 Sensitivity Case Selection (cont.)

- Four key variables – load growth, hydro conditions, natural gas price, generator market power
- Conditions selected were very high (VH), base (B), and very low (VL) based on 90% confidence interval
- 81 possible combinations (3x3x3x3)
- 25 most important cases selected

Most Important Cases – "Importance Sampling"



Developing Case Probabilities

- Used mathematical technique to assign probabilities to remaining 25 cases such that:
  - Sum of probabilities is equal to one
  - Sum of individual probabilities add up to correct distribution (15% VH, 70% B, and 15% VL)
  - Linear program – “Maximum Log-Likelihood”

Proposed General Methodology

- Establish stakeholder process
- Develop reference case
- Select uncertain variables
- Develop variable distributions
- Select sensitivity cases
- Determine joint probability
- Perform simulations and summarize results

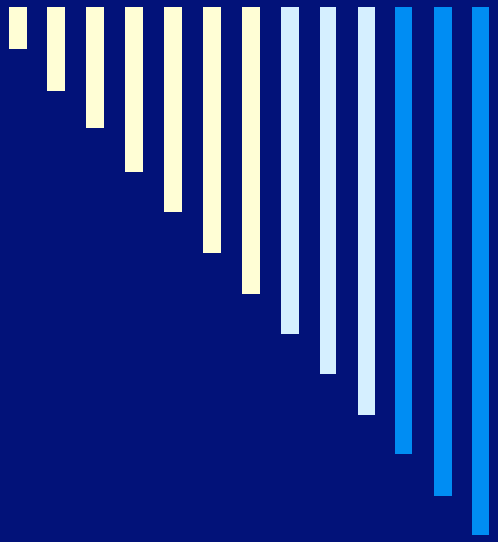
Current Limitations

- Lack of sufficient and appropriate data (e.g. WECC hydro)
- Difficulty in quantifying important uncertainties (e.g. market paradigm, probability and impact)
- Modeling inabilities to reflect important uncertainties (e.g. transmission lines outages)
- Time and resources required to develop each sensitivity case (data, resource plan, market simulation, review, iterate)

- Can result in inability to model sufficient sensitivity cases to fully understand “extreme events”

Conclusions

- Properly-designed sensitivity studies are critical with respect to the derivation of:
  - Expected value
  - Benefit distribution
  - Identifying impact of quantifiable variables
  - Exploratory impact of difficult-to-quantify variables



Questions / Suggestions ?